

## Teachers' perceptions of school nutrition education's influence on eating behaviours of learners in the Bronkhorstspruit District

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Qualitative investigation can provide invaluable information towards understanding the influence of school nutrition education (NE). The study explored teachers' perceptions of the immediate impact of NE on learners' eating behaviours. Twenty-four primary school teachers in the Bronkhorstspruit district, Gauteng, South Africa, who taught nutrition topics to grades four to seven learners, participated in three focus group discussions. Transcript data obtained was analysed using the thematic approach of the framework method. Findings indicated that school support for NE was limited, which undermined the capacity of school NE to influence healthy eating behaviours of learners. The need to strengthen teachers' capacity to model positive eating behaviours was identified. Learners were perceived as being not completely ignorant of healthy eating, with limited capacity to effect changes within the resource-constrained environment. Negative influences like unhealthy choices of food from food vendors and peer influences were identified as needing to be discouraged. Positive influences like the National School Nutrition Programme (NSNP) and the school vegetable garden were to be encouraged. Understanding the prevailing school situation and environment and teachers' perceptions and roles in school NE is important in addressing issues that weaken the influence of NE on learners' eating behaviours.

**Keywords:** eating behaviour; environmental influences; learners; school nutrition education; teachers

### Introduction

Risk factors for nutrition-related diseases among school-going children are frequently reported in the literature (Doak, Visscher, Renders & Seidell, 2006). Immediate ill-health outcomes, such as overweight, obesity and dental caries, may result in long-term health problems including diabetes, heart disease and cancers (Powers, Struempler, Guarino & Parmer, 2005; U.S. Department of Health and Human Services, 2000). Nutrition education has been established as an effective way in which to fight malnutrition and food-related diseases (David, Kimiywe, Waudo & Orodho, 2008). The intermediate school offers an opportunity to influence the eating behaviours of school children (Bauer, Yang & Austin, 2004) and, in this way, to influence eating behaviours of the next generation of adolescents. Moreover, eating patterns formed during childhood often continue into adulthood (Van Cauwenberghe, Maes, Spittaels, Van Lenthe, Brug, Oppert & De Bourdeaudhuij, 2010).

Ensuring the health of learners is vital, not only for their own well being, but also for that of the future workforce and economic growth of a nation, continent and the world (Food and Agriculture Organisation (FAO), 2004). The World Bank (2006) has attributed a loss of as much as 2%-3% of a country's gross domestic growth (GDP) to malnutrition. The advocacy of raising the next generation of healthy individuals is therefore particularly relevant for emerging economies such as South Africa, which are significant contributors to the economic growth in the global economy (Anderson & Strutt, 2013; United Nations, 2015). South Africa, as part of the resource-based group of emerging economies (Dittrich, Giljum, Polzin, Lutter & Bringezu, 2011), is a major player in and contributor to global economic growth. Despite the fact that many emerging economies have witnessed high rates of economic growth, being able to sustain steady economic growth over a long period of time remains a challenge (United Nations, 2013). School NE is one of the approaches necessary to offer support to economic sustainability in emerging economies such as South Africa.

School environmental factors, such as readily available unhealthy choices of foods, unpalatable preparation of nutritious meals, and limited time for eating, are some reasons that learners often make unhealthy food choices (Bauer et al., 2004; Bos, Van der Lans, Van Rijnsoever & Van Trijp, 2013). A study on dietary habits of school children in South Africa revealed the widespread availability of foods high in fats, sugars and salt (Temple, Steyn, Myburgh & Nel, 2006). These foods included potato crisps, candies, chocolates, sausage on white bread, vetkoek (dough deep-fried in oil), and soft drinks.

In South African primary schools (intermediate classes), nutrition is taught as part of subjects such as Life Skills and Natural Science and Technology. Nutrition-related topics include the dietary habits of children, healthy eating, nutrients in food, food processing and food hygiene. The curriculum has the goal of promoting learners' knowledge and understanding of nutrition for improving their health and that of the community (Department of Basic Education (DoBE), Republic of South Africa, 2011a, 2011b). Doak et al. (2006) recommend incorporating NE into the school curriculum to achieve a long-term, sustainable positive impact on the eating behaviours of learners. The NSNP serves as an additional support to NE in South African primary schools. The programme is an initiative of the DoBE, which aims to provide nutritious meals to learners in order to improve their learning ability (DoBE, Republic of South Africa, 2014). The success of school NE on shaping

learners' eating behaviours cannot be guaranteed without the support of the school environment and authority (FAO, 2005). Qualitative enquiry in nutrition investigates how and why people behave the way they do in respect to food and food-related issues. This approach is relevant in view of the rapid change in people's eating behaviour, that leads to increased risk for nutrition-related diseases (Swift & Tischler, 2010). Qualitative research can provide invaluable information on decision-making processes, as well as answers to the numerous research questions regarding nutrition-related behaviours (Centre for Reviews and Dissemination (CRD), 2009; Swift & Tischler, 2010).

Previous studies have established the importance of teachers' roles in shaping healthy eating behaviours among learners. The roles include modelling healthy eating behaviours for learners, and adapting nutrition curriculum topics to the specific needs and environment of learners (Kupolati, MacIntyre & Gericke, 2014; Rosário, Araújo, Oliveira, Padrão, Lopes, Teixeira, Moreira, Barros, Pereira & Moreira, 2012). However, little is known about teachers' own perceptions of the various factors of importance to learners' eating behaviours. This study aimed to explore teachers' perceptions of the influence of school NE on learners' eating behaviours for informing the development of a culturally and environmentally appropriate school NE programme.

## Methods

### Methodological Approach

A phenomenological approach in the qualitative domain was employed to collect data in three focus group discussions (FGDs). Three FGDs were considered adequate, as no new information emerged from the third FGD.

### Participants

The study took place between July and August 2013 in Bronkhorstspruit, a resource-constrained community east of Pretoria in Gauteng, South Africa. The study participants were primary school teachers who taught Life Skills and Natural Science and Technology to Grade Four to Seven learners in three schools, purposively selected by the Gauteng DoBE as part of a larger study. The larger study entitled *Schools as sites for social change: Facilitating adjusted behaviour in resource-constrained communities by empowering children*, was undertaken by the Institute for Food, Nutrition and Well-being at the University of Pretoria. Learners in Grades Four to Seven are undergoing a rapid growth phase with increased nutrient needs, and are only just forming their food habits (FAO, 2005). To be eligible, teachers must have taught or been teaching nutrition topics during the year of the study. The purposive sampling of teachers was to secure a group with similar experiences in teaching

nutrition, so as to generate a rich discussion on the topic. Teachers were invited to participate in the study by a letter of introduction, which also requested informed consent from all who were eligible. All eligible teachers (30) agreed to participate in the study, although not all were present for the FGDs because of other school commitments.

### Procedures

FGDs were conducted in English by the researcher, with a research assistant who took notes and made the audio recordings according to the recommended procedures (Harris, Gleason, Sheean, Boushey, Beto & Bruemmer, 2009). Before commencement of the FGD, participants were assured of confidentiality and permission for audio recording was obtained. An interview guide previously subjected to face and content validity by the researcher's colleagues guided the discussions. Examples of questions were, 'what is your understanding of nutrition education in primary schools?', and 'do you think that teaching nutrition in the classroom can translate to learners adopting healthy eating?' Though the interview guide provided direction for the discussions, questions were modified where necessary to address participants' responses. FGDs took place in the staff common room immediately after school hours to prevent the disruption of lessons and encroachment into teachers' work time, and lasted between 58 and 75 minutes.

### Human Subjects' Approval

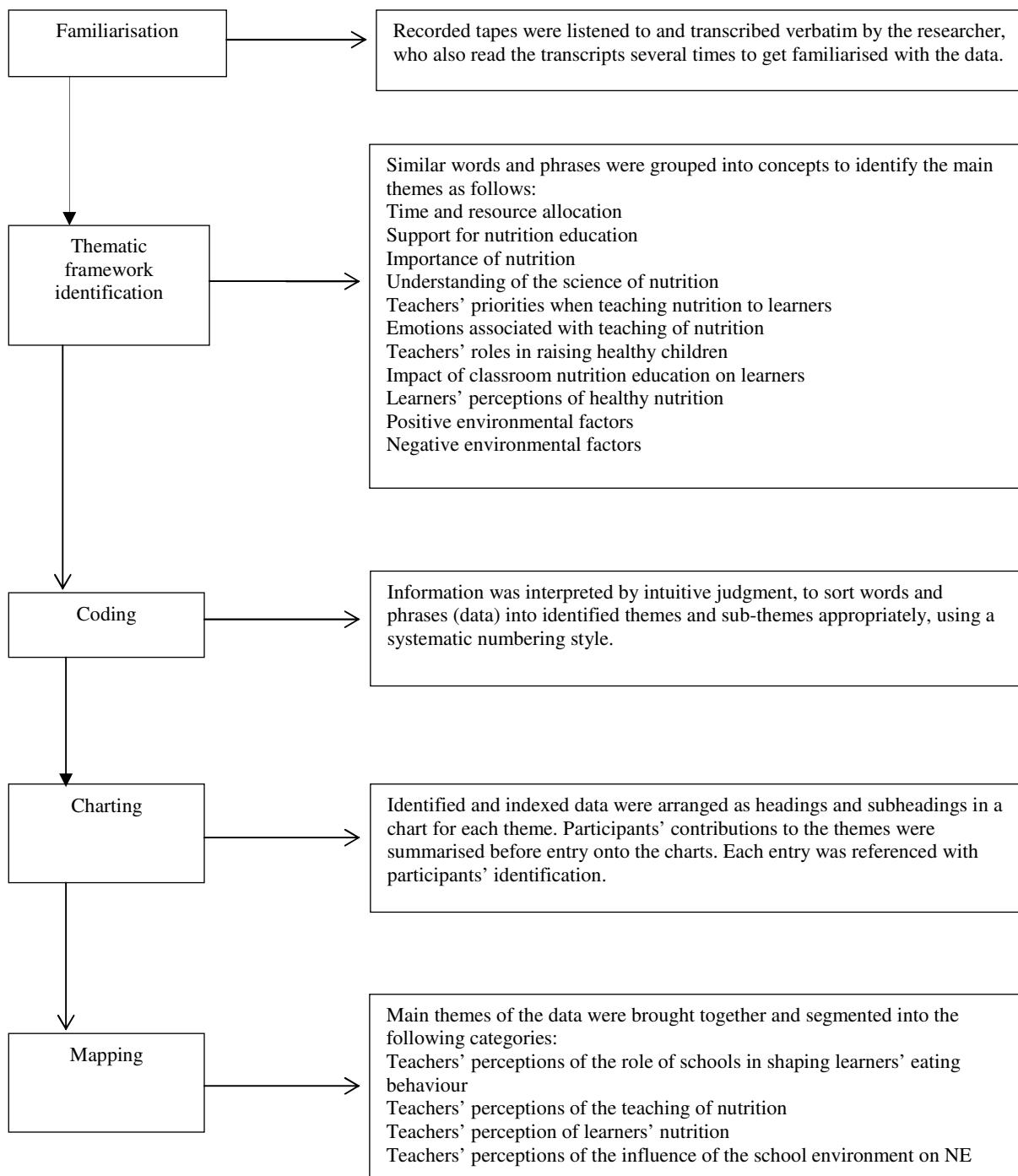
The study protocol was approved by the Ethics Committee of the Natural and Agricultural Sciences of the University of Pretoria and the Gauteng DoBE.

### Data Analysis

Data was analysed following the thematic approach of the framework method (Figure 1), which entails familiarising with the data, identifying thematic pattern, coding the themes, arranging the themes into charts and mapping (Dixon-Woods, 2011; Ritchie & Spencer, 2002).

### Results

A total of 24 teachers (14 females) participated in the study (Table 1). The mean age of the participants was 45 (range 27-54) years, where the mean years of teaching experience was 17 (range 1-35). Perceptions of teachers are described in four categories: the role of the school in shaping learners' eating behaviour; the teaching of nutrition in schools; learners' nutrition; and the influence of the school environment on NE. Barriers to and facilitators of learners' healthy eating behaviours identified by teachers are also described. Direct quotations describing teachers' perceptions of certain issues are given. Data is identified by the group (FG) and participant (P) numbers e.g. "FG1, P2" indicates Focus Group 1, Participant 2.



**Figure 1** Flow-chart for the thematic approach of data analysis (Dixon-Woods, 2011; Ritchie & Spencer, 2002)

**Table 1** Characteristics of Participants (N = 24)

Focus group	Total number of participants (n)	Male (n)	Female (n)	Age (mean ± SD) years	Teaching experience (mean ± SD) years
FGD 1	7	2	5	42 ± 11	15 ± 11
FGD 2	10	3	7	45 ± 10	18 ± 10
FGD 3	7	2	5	48 ± 6	17 ± 13

Note: SD = Standard deviation

### Teachers' Perceptions of the Role of the School in Shaping Learners' Eating Behaviours

Teachers' perceptions of the role of the school in shaping learners' eating behaviours comprised three main themes: time- and resource-allocation, support for NE, and importance of NE in schools.

Time- and resource-allocation were perceived to be inadequate if NE in schools was to help learners to become accustomed to healthy eating behaviours. Learners learn better if they participate in activities that demonstrate what is taught, with adequate resources for teaching aids.

*Time allocation is very small. For example, if I must teach food processing, I should [conduct a] demonstration for learners, [so as] to be able to learn and understand. The time is not adequate (FG2, P3).<sup>i</sup>*

*We [...] also [don't] have enough resources. The only resource we have is the textbook (FG3, P6).<sup>ii</sup>*

Varied views were expressed regarding support for NE in schools. While some teachers expressed the fact that there was support, others indicated that support was in place, but inadequate. Still others expressed the fact that support (other than the teaching curriculum and the recommended textbooks) was not in place at all.

*We don't have enough support. There is no general information coming to learners on the assembly that learners must not buy unhealthy foods like sweets, Simba, and the rest (FG1, P4) [sic].*

Support mentioned included in-service training in nutrition, the provision of a school vegetable garden, and a supply of vegetables from the school garden to supplement the NSNP. The NSNP was mentioned as a tangible support by the school.

*My school is supporting [the initiative] through the school garden. Sometimes from the school garden, vegetables are supplied to support the NSNP (FG2, P3).<sup>iii</sup>*

Regarding the importance of NE in schools, teachers were of the view that it can have far-reaching effects, in addition to the immediate benefits of informing learners about healthy eating. If learners have adequate NE, they would be able to pass the messages on to their parents and the community.

*I think it is necessary, because it will help learners, plus the parents, plus the community. What the learners learn, they can pass on to others (FG2, P1).*

Teachers also perceived that even if learners were not able to utilise the information they received as a result of their resource-constrained environment, they would be informed, and could make use of the information in future. Other benefits of NE for learners mentioned included: empowering learners to choose healthy foods, to take responsibility for their health, and to prevent nutrition-related diseases. Additionally, learners would have good mental development, which could enhance academic performance.

*Learners will know that healthy foods are necessary for the development of their brains and*

*for healthy minds, and so they will be able to learn better (FG2, P4).*

NE in schools was also perceived as having the potential to benefit the health of teachers who teach nutrition to learners, since they would demonstrate good nutrition through their own behaviour.

### Teachers' Perceptions of the Teaching of Nutrition

The four main themes identified were: teachers' understanding of the science of nutrition; teachers' priorities when teaching nutrition to learners; emotions associated with the teaching of nutrition; and teachers' roles in raising healthy children.

Teachers expressed their understanding of the science of nutrition in terms of the nutrition information, they would pass on to learners. The messages included helping learners to know the right types of foods, and to make healthy food choices, about food preparation, and how to avoid unhealthy choices of foods.

*How to teach learners what to eat and how to cook, which foods to eat regularly, and which foods not to eat (FG1, P3).*

In addition, nutrition messages, such as balanced diets, the role of foods in the body, and of the nutrients in food, were expressed in teachers' accounts of their understanding of NE at schools.

*To [teach learners] what is suitable for their body (FG3, P1).<sup>iv</sup>*

*The way in which learners are taught what food to [eat] in order to prevent diseases and be healthy (FG2, P1).<sup>v</sup>*

Teachers viewed their priorities when teaching nutrition to learners as an opportunity to impart life-long healthy eating to learners, aside from imparting knowledge to help them to pass the subject at school. Many teachers expressed their teaching priorities as imparting knowledge first, after which they help learners put what they have learnt into practice. In this way, according to these teachers, learners' learning could benefit their lives. One teacher expressed the fact that knowledge is power, and that once children internalise a concept, they can maintain that concept, and use it as a life skill. However, concerns that the resource-constrained environment of the learners might limit the practical application of their nutrition knowledge, were expressed at all the FGDs.

*My priorities are for them to imbibe [sic] lifelong healthy eating [practices] and at the same time, for them to pass. Now, many of them may not be able to afford it, but the knowledge can be useful for them in the future (FG2, P7).<sup>vi</sup>*

Emotions associated with teaching nutrition may influence the effective delivery of nutrition messages by teachers, where feelings of guilt and inadequacy were expressed.

*...because I think it is hard to practice, so I wonder if they will practice all of them, as I myself do not practice some of these things (FG1, P4).*

They also felt guilty about providing information that learners might not be able to follow in a re-

source-constrained environment with limited access to a variety of foods.

*I feel guilty because of the children's socio-economic background, as a result of which they cannot afford the healthy foods we advocate for them to eat (FG1, P7) [sic].*

Feelings of inadequacy emerged in respect of the teachers' limited understanding of certain topics in nutrition.

*Like myself, I am not so much clear about nutrition, so to teach them I must prepare first. I need to just [explore] the textbook (FG3, P3).<sup>vii</sup>*

Teachers explained that they used the textbooks to teach, even though they might not feel comfortable about their insight. Teachers also expressed feelings of inadequacy as a result of limited resources for illustrations and for demonstrations. Teachers explained that the subject of nutrition would be better assimilated when learners experienced the foods and the processes involved. A few teachers expressed the fact that they felt comfortable teaching nutrition, as it gave them the opportunity to share knowledge and to impart the value of healthy eating to learners.

In respect of teachers' roles in raising healthy children, teachers agreed that they could model desirable healthy-eating behaviours for learners to emulate. This could be facilitated when teachers have lunch with learners, by showing them what they (the teachers) have for lunch. Teachers explained that displaying healthy food choices on the teacher's desk was a way to model healthy eating for learners.

*Teacher[s] can come with a bottle of water and banana and leave them on the table, the second day he/she [can] come [...] with an apple and a bottle of water and leave them on the table. Learners will be seeing these actions and [will] receive the message [...] that our teacher is [in the habit of eating] fruit [...] and water (FG1, P6).<sup>viii</sup>*

Through these actions, nutrition messages could be shared with learners without a word being said. Verbal actions, such as reprimanding learners when they were seen eating foods that were unhealthy choices, or engaging in unhealthy eating behaviours, were things that teachers could do to influence learners' eating behaviours. The commendation of the healthy-eating behaviour of learners in front of others could go a long way to encourage the appropriate behaviour among learners. The use of posters to illustrate nutrition messages was mentioned as a non-verbal activity, through which learners' eating behaviour could be influenced.

#### Teachers' Perceptions of Learners' Nutrition

Two main themes, the impact of classroom NE on learners, and teachers' perceptions of learners' understanding of healthy nutrition, were identified. Teachers' view of the impact of classroom NE on learners was that the NE learners receive in the class did not seem to significantly influence their (learners) eating habits.

*If nutrition is taught as a subject, then it [becomes] understandable, but if it is [taught piecemeal], it is limited in [its] capacity to help learners to imbibe [sic] lifelong eating habits (FG3, P3).<sup>ix</sup>*

Learners were observed to make unhealthy food choices. Although they had the knowledge that frequent consumption of foods, such as an extruded corn snack (commonly called 'Simba' by learners), candies and ice-cream, were not good for their health, many of them would have these foods for lunch.

*The issue is not that they are totally unaware of healthy eating, but [...] they are so used to the things they like to eat, which are also very cheap (FG1, P4).*

Furthermore, it was deduced that though learners were aware of what constitutes healthy eating, they ultimately had limited capacity to effect changes. These unhealthy choices of foods were cheap, and were easily accessible to learners. Another view expressed by teachers was that learners were frightened when they were made to realise the negative outcomes of unhealthy eating. As a result, they made efforts towards healthy food choices, but these efforts did not stretch beyond the short term.

Teachers' perceptions of learners' understanding of healthy nutrition related to two aspects. Firstly, learners were perceived to lack proper nutrition knowledge, especially regarding foods beneficial to health. This was shown in learners' tendency to reject some foods, particularly vegetables served in the NSNP, associating them with poverty.

*Who, when cabbage is served in NSNP, will reject it with pride? Instead, such learners would buy unhealthy foods for lunch showing that they don't belong [amongst] [...] the poor (FG1, P7).<sup>x</sup>*

The attitudes of some parents might have contributed to learners' behaviour in this instance, as parents would boast that they ate meat and not vegetables in their homes to convey the same inference. Secondly, teachers were of the view that learners were willing to learn and internalise healthy dietary attitudes, barring all limiting circumstances. Parental influence and inadequate school NE, amongst other factors, were identified as factors that affected learners' eating behaviours.

#### Teachers' Perceptions of the Influence of the School Environment on Nutrition Education

The way in which positive and negative environmental influences impacted learners' eating behaviours emerged as main themes. Factors considered here were limited to those in the school environment.

Teachers identified the following as positive environmental factors for improving learners' eating behaviours: improving and increasing the teaching of nutrition in the classroom; providing NE for food vendors; making only healthy foods available in the school tuck shops; and continuing to serve healthy foods in the NSNP.

*The NSNP provided by the government is a good way to influence learners to imbibe [sic] healthy eating habits (FG2, P6).*

Concerning learners' refusal to eat certain foods served in the NSNP, teachers were of the view that learners would not refuse to eat the foods if the foods were prepared in a tastier way. The development of a vegetable garden was perceived as an important positive factor. It was argued that children got more interested in that which they were able to participate, rather than in what they were taught.

*Learners should be given chance to work on the school garden so that they can practice at home, plant their own vegetables, and eat [...] them (FG2, P3).*

This was the case in one of the schools, where learners participated with enthusiasm in planting a vegetable garden, and were happy to eat the food prepared with vegetables from the garden.

Two sub-themes that emerged from the teachers' views of the negative environmental factors on school NE are unhealthy choices of food from vendors, and peer influences. All the FGDs expressed that unhealthy choices of food available in schools present serious challenges to learners' food choices. Unhealthy choices of food, as already mentioned, were cheap, easily available, and were appealing to learners. According to the participants, the foods became so tempting, that they affected learners' ability to translate what was learnt in class into practice. Teachers expressed with regret that the efforts made to intervene in what was offered by vendors, had been unproductive.

*We have tried many times to tell food vendors what to sell and what not to sell. They were of the view that those things we wanted them to sell were not profitable (FG2, P1).*

Unhealthy foods were not only available from food vendors but also from school tuck shops. Peer influences were perceived as another strong negative environmental influence on learners' eating behaviours. Children wanted to do what they saw their friends doing. When some learners boycotted foods from the NSNP, they usually bought unhealthy foods. As noted, this behaviour seems to influence those children who would not like to be perceived by their peers as poor.

## Discussion

This study examined teachers' perceptions of the potential of NE in schools to impart to learners those healthy eating behaviours that could have lifelong beneficial consequences. Their views shed light on how the school, the teachers, the learners and the school environment facilitate or hinder successes that school NE could achieve. The findings are discussed across the four categories: the role of the school in shaping learners' eating behaviour; the teaching of nutrition in schools;

learners' nutrition; and the influence of the school environment on NE.

Our study showed that NE received support from the school authority, though to a limited extent – probably as a result of limited resources. Support seemed to be insufficient to put school NE on a platform from which to positively influence the eating behaviours of learners. The findings of our study are consistent with the findings of Pérez-Rodrigo & Aranceta (2001) in their review of school-based NE. Time- and resource-allocations were consistently reported to be insufficient. Recent studies have reported limited time and resources for NE in South African schools (Nguyen, De Villiers, Fourie, Bourne & Hendricks, 2013; Oldewage-Theron & Egal, 2012). It is common to have nutrition treated as a topic in other subjects and not as a distinct subject in many primary schools across Africa (United Nations Standing Committee on Nutrition, 2009). The potential of school NE to benefit the health of learners, school staff and the community as revealed from our study, has been reported in many studies (David et al., 2008; Falter, Pignotti-Dumas, Popish, Petrelli, Best & Wilkinson, 2011; Lakshman, Sharp, Ong & Forouhi, 2010). Furthermore, school NE has the potential to promote education, intellectual capacity, and the social development of a country (United Nations Standing Committee on Nutrition, 2009).

Teachers saw their role in NE in schools to disseminate nutrition information in a literal manner. Their explanations were devoid of the basic components necessary to facilitate translation of nutrition knowledge into practice. Components such as presenting nutrition in the context of the learners' situation, and using examples to which learners can relate, were missing. Contento (2007) explained NE as the use of educational strategies in combination with environmental factors, to facilitate voluntary adoption of healthy dietary practices. Teachers generally expressed the desire to impart lifelong healthy eating as one of their priorities in teaching nutrition to learners. While this position is commendable, the prospect of realising this goal is questionable in the light of many unfavourable environmental factors, and the teachers' limited understanding of nutrition concepts. The need for nutrition training for teachers was confirmed in a South African study, where teachers admitted to limited knowledge about nutrition and healthy dietary habits (Nguyen et al., 2013). The participants' experience in teaching nutrition (mean = 17 years) made them information-rich cases, which enhanced the credibility of the data. Despite many years of experience teaching nutrition, teachers in our study still expressed their need for training in teaching nutrition. This finding is further corroborated in the teachers' responses to their roles in

NE in schools. In Nguyen et al.'s (2013) study, teachers reported a lack of knowledge in nutrition and healthy dietary habits, which they attributed to their not being experts in the subject.

Unfavourable factors include the resource-constrained environment, unhealthy foods at low cost available from vendors, and limited time and resources for NE. Teachers in our study, however, perceived the resource-constrained environment as a serious challenge to NE. This is consistent with the findings of David et al. (2008), where the unavailability of resources in the community limited teaching aids for NE. The teachers' role in raising healthy individuals was perceived by teachers across the FGDs as very important. This is in agreement with the findings of Vander Schee & Gard (2014) that teachers are urged to model healthy eating for learners, and to look after their own health. Teachers' good health status improves their effectiveness as role models. The perceived responsibilities of teachers to model learners' eating behaviour, reprimand unhealthy eating and commend healthy eating were revealed. Teachers' responsibility to model healthy eating is also consistent with the views of Rafiroiu and Evans (2005) that teachers who have good nutrition knowledge might be able to personally model appropriate nutrition-related behaviours for learners.

Learners were perceived not to be completely unaware of what constitutes healthy eating, but they had limited capacity to effect changes, either in terms of their means or their attitudes. Learners' resource-constrained environment was identified as a limiting factor in a South African study (Oosthuizen, Oldewage-Theron & Napier, 2011). The resources locally available could be properly channelled with the use of appropriate educational strategies, as advocated by Contento (2007). Nguyen et al. (2013) expressed the need for teachers to convey to learners that one does not have to be wealthy in order to have a balanced diet. Fears of negative outcomes of unhealthy eating were perceived to yield a temporary positive response to adopt healthy eating among learners in our study. Children tend to lose motivation after some time, when receiving consistent negative feedback for a given behaviour (Schunk, 2012). Teachers' perceptions of learners' eating behaviour in this study were mixed. While learners were not ignorant about healthy eating, they lacked nutritional knowledge in some areas. This is in agreement with the findings of Nguyen et al. (2013), who confirmed that poor nutrition knowledge was an important factor in learners making unhealthy choices of foods. Their refusal to eat certain vegetables and some foods served in the NSNP probably reflected ignorance. Children's dislike for vegetables has been documented in the literature, with many intervention efforts having been directed toward this issue (He, Beynon, Sangster Bouck, St Onge,

Stewart, Khoshaba, Horbul & Chircoski, 2009; Prelip, Slusser, Thai, Kinsler & Erausquin, 2011; Rosário et al., 2012).

It is interesting to note that classroom NE was perceived as an important school environmental factor to promote healthy eating among learners. This result suggests that even with the curriculum in place, more needs to be done to ensure nutrition messages are effectively transmitted to learners. Other environmental factors identified as potential positive influences on learners' eating behaviours were: provision of NE to food vendors; availability of only healthy choices of food in tuck shops; and the NSNP. This finding is consistent with the recommendation that school tuck shops and school events should feature foods that are healthy choices (Nguyen et al., 2013). Teachers in all the FGDs discussed how a vegetable garden could serve as a means of helping learners buy into healthy eating. This finding agrees with the findings of David et al. (2008), where learners followed up on gardening practice by planting new crops at home.

Unhealthy choices of food available from vendors and tuck shops were viewed by the teachers as having a major influence on learners' eating behaviour in our study. This is consistent with the study of Bauer et al. (2004) where easy access to non-nutritious foods inhibited students from taking advantage of a programme designed to help them eat a balanced diet. Learners were also perceived to be influenced by their peers to boycott foods served from the NSNP in our study, because they would not like to be seen as poor. Instead, such learners often purchased unhealthy choices of snacks from vendors.

### Limitations

The research was conducted in school settings involving teachers who were employees under an authority. This situation might have led to teachers not expressing candid views, especially on issues relating to policy. The schools were located in a resource-constrained setting, which means that results obtained might not be applicable to schools in affluent settings. In addition, the absence of eight eligible teachers at the FGDs could have led to missing information, which might have enriched the findings of this study. The information obtained was limited to experienced teachers, whereas different results might have been obtained from inexperienced teachers.

### Implications for Research

Findings from this study revealed how learners refused some vegetables and foods served in the NSNP. Meanwhile, learners' inability to practice healthy eating was perceived by teachers to be attributable to the resource-constrained environment. Therefore, it is clear that learners in resource-constrained communities need to be assisted so as

to effectively utilise locally available foods in order to benefit their health. In addition, teachers' skills in teaching nutrition could be improved through training in nutrition topics and concepts that integrate the circumstance of the learners. Learners' willingness to learn, as revealed by this study, indicates that learners will respond positively to NE that appropriately addresses mediators of issues. The fact that learners were selective about foods served at the NSNP suggests that the palatability of those foods supplied by the programme might need to be improved, to increase acceptability.

### Conclusion

The school is a potential platform from which to influence learners' eating behaviours. By providing learners with relevant nutrition knowledge and skills, school NE has the potential to reduce nutrition-related diseases that could undermine prospects for sustained economic growth in emerging economies, such as South Africa. Therefore, NE in schools could contribute to reducing loss in the country's GDP, as reported by the World Bank (2006). However, constraints on school time and resources make adequate allocation for NE very challenging. The understanding of NE by teachers needs to be taken beyond passing nutrition messages to the level where appropriate educational strategies will be integrated while effectively harnessing teachers' influence. Appropriate nutrition information delivery can exploit learners' willingness to learn, solving the problem of poor nutrition knowledge and ignorance among learners. Environmental factors play a significant role in the realisation of improved healthy eating among learners. Positive factors, such as appropriate NE delivery, and nutritious meals served in the NSNP and school vegetable garden, must be strengthened. Likewise, negative environmental factors, such as unhealthy choices of foods from the food vendors and peer influences among learners, must be discouraged.

Teachers have an important role to play in modelling learners' eating behaviours. Their recognition of this responsibility and their readiness to give support is a huge milestone in the process of raising a future generation of healthy individuals. Teachers, however, need to be equipped with sound nutrition knowledge and skills for NE delivery in order to optimise the benefits of school NE on learners' eating behaviours.

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### Notes

- i. Verbatim quotation was edited for the publication.
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- ix. Verbatim quotation was edited for the publication.
- x. Verbatim quotation was edited for the publication.

### References

Anderson K & Strutt A 2013. *Emerging economies, productivity growth, and trade with resource-rich economies by 2030*. Australian Agricultural and Resource Economics Society 57<sup>th</sup> conference, Sydney, Australia, 5-8 February.

Bauer KW, Yang YW & Austin SB 2004. "How can we stay healthy when you're throwing all this in front of us?" Findings from focus groups and interviews in middle schools on environmental influences on nutrition and physical activity. *Health Education & Behavior*, 31(1):34-46. doi: 10.1177/1090098103255372

Bos C, Van der Lans IA, Van Rijnsoever FJ & Van Trijp HCM 2013. Understanding consumer acceptance of intervention strategies for healthy food choices: a qualitative study. *BMC Public Health*, 13:1073. doi: 10.1186/1471-2458-13-1073

Centre for Reviews and Dissemination (CRD) 2009. *Systematic reviews: CRD's guidance for undertaking reviews in health care*. York, UK: University of York. Available at [http://www.york.ac.uk/inst/crd/pdf/Systematic\\_Reviews.pdf](http://www.york.ac.uk/inst/crd/pdf/Systematic_Reviews.pdf). Accessed 5 January 2014.

Contento IR 2007. *Nutrition education: Linking research, theory, and practice*. Sudbury, MA: Jones and Bartlett Publishers.

David DM, Kimiywe JO, Waudo JN & Orodho JA 2008. Promotion of nutrition education interventions in rural and urban primary schools in Machakos district, Kenya. *Journal of Applied Biosciences*, 6:130-139. Available at <http://m.elewa.org/JABS/2008/6/1.pdf>. Accessed 25 December 2013.

Department of Basic Education (DoBE), Republic of South Africa 2011a. *National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Intermediate Phase Grades 4-6: Life Skills*. Pretoria: DBE, Republic of South Africa.

DoBE, Republic of South Africa 2011b. *National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Intermediate Phase Grades 4-6: Natural Sciences and Technology*. Pretoria: DBE, Republic of South Africa. Available at <http://www.education.gov.za/LinkClick.aspx?fileticket=IzbFrpoQ44=>. Accessed 12 August 2012.

DoBE, Republic of South Africa 2014. *National School*

*Nutrition Programme*. Available at <http://www.education.gov.za/TheDBE/DBEStructure/SocialandSchoolEnrichment/NationalSchoolNutritionProgramme/tabid/131/Default.aspx>. Accessed 10 March 2014.

Dittrich M, Giljum S, Polzin C, Lutter S & Bringezu S 2011. *Resource use and efficiency in emerging economies* (Sustainable Europe Research Institute (SERI), Working Paper 12). Austria: SERI. Available at [http://seri.at/wp-content/uploads/2011/03/SERI\\_WorkingPaper12.pdf](http://seri.at/wp-content/uploads/2011/03/SERI_WorkingPaper12.pdf). Accessed 28 May 2014.

Dixon-Woods M 2011. Using framework based synthesis for conducting reviews of quantitative studies. *BMC Medicine*, 9:39. doi:10.1186/1741-7015-9-39

Doak C, Visscher TLS, Renders CM & Seidell JC 2006. The prevention of overweight and obesity in children and adolescents: a review of interventions and programmes. *Obesity Reviews*, 7(1):111-136. Available at <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-789X.2006.00234.x/pdf>. Accessed 15 December 2013.

Falter RA, Pignotti-Dumas K, Popish SJ, Petrelli HMW, Best MA & Wilkinson JJ 2011. A service learning programme in providing nutrition education to children. *American Journal of Pharmaceutical Education*, 75(5): Article 85. doi: 10.5688/ajpe75585

Food and Agriculture Organisation (FAO) 2004. *Incorporating nutrition considerations into development policies and programmes*. Rome: FAO. Available at <ftp://ftp.fao.org/docrep/fao/007/y5343e/y5343e00.pdf>. Accessed 15 May 2012.

FAO 2005. *Nutrition Education in Primary Schools* (Vol. 1: The Reader). Rome: FAO. Available at <http://www.fao.org/3/a-a0333e.pdf>. Accessed 10 December 2014.

Harris JE, Gleason PM, Sheean PM, Boushey C, Beto JA & Bruemmer B 2009. An introduction to qualitative research for food and nutrition professionals. *Journal of the American Dietetic Association*, 109(1):80-90. doi: <http://dx.doi.org/10.1016/j.jada.2008.10.018>

He M, Beynon C, Sangster Bouck M, St Onge R, Stewart S, Khoshaba L, Horbul BA & Chircoski B 2009. Impact evaluation of the northern fruit and vegetable pilot programme - a cluster-randomised controlled trial. *Public Health Nutrition*, 12(11):2199-2208. doi: <http://dx.doi.org/10.1017/S1368980009005801>

Kupolati MD, MacIntyre UE & Gericke GJ 2014. School-based nutrition education: features and challenges for success. *Nutrition & Food Science*, 44(6):520-535. doi: <http://dx.doi.org/10.1108/NFS-01-2014-0001>

Lakshman RR, Sharp SJ, Ong KK & Forouhi NG 2010. A novel school-based intervention to improve nutrition knowledge in children: cluster randomised controlled trial. *BMC Public Health*, 10:123. doi: 10.1186/1471-2458-10-123

Nguyen KA, De Villiers A, Fourie JM, Bourne LT & Hendricks MK 2013. The feasibility of implementing food-based dietary guidelines in the South African primary-school curriculum. *Public Health Nutrition*, Advance Access. doi: <http://dx.doi.org/10.1017/S1368980013003194>

Oldewage-Theron W & Egal A 2012. Impact of nutrition education on nutrition knowledge of public school educators in South Africa: A pilot study. *Health SA Gesondheid*, 17(1):8 pages. doi: 10.4102/hsag.v17i1.602

Oosthuizen D, Oldewage-Theron WH & Napier CE 2011. The impact of a nutrition programme on the dietary intake patterns of primary school children. *South African Journal of Clinical Nutrition*, 24(2):75-81.

Pérez-Rodrigo C & Aranceta J 2001. School based nutrition education: lessons learned and new perspectives. *Public Health Nutrition*, 4(1A):131-139.

Powers AR, Struempler BJ, Guarino A & Parmer SM 2005. Effects of a nutrition education programme on the dietary behavior and nutrition knowledge of second-grade and third-grade students. *Journal of School Health*, 75(4):129-133.

Prelip M, Slusser W, Thai CL, Kinsler J & Erausquin JT 2011. Effects of a school-based nutrition programme diffused throughout a large urban community on attitudes, beliefs, and behaviours related to fruit and vegetable consumption. *Journal of School Health*, 81(9):520-529. doi: 10.1111/j.1746-1561.2011.00622.x

Rafiroiu AC & Evans A 2005. Nutrition knowledge, attitudes, and practices among nutrition educators in the south. *American Journal of Health Studies*, 20(1-2):29-38.

Ritchie J & Spencer L 2002. Qualitative data analysis for applied policy research. In AM Huberman & MB Miles (eds). *The qualitative researcher's companion*. London: Sage Publications.

Rosário R, Araújo A, Oliveira B, Padrão P, Lopes O, Teixeira V, Moreira A, Barros R, Pereira B & Moreira P 2012. The impact of an intervention taught by trained teachers on childhood fruit and vegetable intake: a randomised trial. *Journal of Obesity*, 2012: Article ID 342138, 8 pages. doi: <http://dx.doi.org/10.1155/2012/342138>

Schunk DH 2012. *Learning theories: An educational perspective* (6th ed). Boston, MA: Pearson.

Swift JA & Tischler V 2010. Qualitative research in nutrition and dietetics: getting started. *Journal of Human Nutrition and Dietetics*, 23(6):559-566. doi: 10.1111/j.1365-277X.2010.01116.x

Temple NJ, Steyn NP, Myburgh NG & Nel JH 2006. Food items consumed by students attending schools in different socioeconomic areas in Cape Town, South Africa. *Nutrition*, 22(3):252-258. doi: <http://dx.doi.org/10.1016/j.nut.2005.07.013>

United Nations 2013. *World Economic and Social Survey 2013: Sustainable Development Challenges*. New York: United Nations. Available at <http://sustainabledevelopment.un.org/content/documents/2843WESSION2013.pdf>. Accessed 28 May 2014.

United Nations 2015. *World economic situation and prospects 2015*. New York: United Nations. Available at <http://www.un.org/esa/policy/wesp/wesp.html>.

Accessed 28 May 2014.

United Nations Standing Committee on Nutrition 2009. *Why nutrition is important*. Available at <http://www.unscn.org/en/home/why-nutrition-is-important.php>. Accessed 28 May 2014.

U.S. Department of Health and Human Services 2000. *Healthy People 2010: Understanding and Improving Health* (2<sup>nd</sup> ed). Washington, DC: U.S. Government Printing Office. Available at [http://health-equity.pitt.edu/640/1/Healthy\\_People\\_2010-Under\\_and\\_Improv\\_Health.pdf](http://health-equity.pitt.edu/640/1/Healthy_People_2010-Under_and_Improv_Health.pdf). Accessed 31 March 2015.

Van Cauwenberghe E, Maes L, Spittaels H, Van Lenthe FJ, Brug J, Oppert JM & De Bourdeaudhuij I 2010. Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: systematic review of published and 'grey' literature. *British Journal of Nutrition*, 103(6):781-797. doi: <http://dx.doi.org/10.1017/S0007114509993370>

Vander Schee C & Gard M 2014. Healthy, happy and ready to teach, or why kids can't learn from fat teachers: the discursive politics of school reform and teacher health. *Critical Public Health*, 24(2):210-225. doi: 10.1080/09581596.2013.828152

World Bank 2006. *Repositioning Nutrition as central to development: A strategy for large-scale action*. Washington, DC: World Bank. Available at <http://go.worldbank.org/M63XQNCQ20>. Accessed 25 July 2012.